Rational Preselection from Hamadryas to *Homo Sapiens*: The Place of Decisions in Adaptive Process

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Normally biological and sociocultural evolution are explained in terms of blind variation and selective retention. This theory avoids intrinsic teleological fallacies but fails to account for a type of purposive behavior that is both distinctive and adaptively significant. The preselective hypothesis advanced here asserts that certain highly social animals including Homo sapiens *are able to anticipate complex evolutionary problems. They may then beat natural selection to the draw by making their own deliberate adaptive choices, where the advantage of doing so is perceptually obvious. Such decisions occur both at the individual level and through political processes at the group level. Especially in group preselection, the result is an adaptive mechanism of unparalleled flexibility and rapidity of action, one very inadequately accounted for by ethnologists. Implications are suggested for ethology, archaeology, and ethnology in terms of redefining culture and revising models of cultural adaptation and evolution to make the study of process more effective.* [evolutionary theory, cultural ecology, decision process, ethology, cognition]

DEFINING THE PROBLEM

Introduction: Preselection in Contemporary Homo Sapiens

IT IS COMMONLY TAKEN FOR GRANTED that contemporary *Homo sapiens* living in industrialized state societies is a purposive animal. However, evolutionists and ecologists, locked into a blind variation and selective retention model using outcomes of individual genetic competition as the criteria for adaptive success, seem uncertain as to how to handle this creature; indeed, they seem rather unsure as to whether biologically defined evolutionary process still continues at all in ways that are adaptively significant.

It is clear that human cultural capacity, leading to purposive and effective adaptive manipulation of the environment, has been responsible for this significant contemporary

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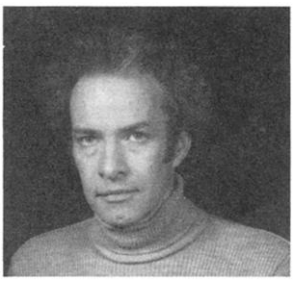

transformation in human evolutionary status. But so far this transformation has not been defined adequately in terms of the modified biosociocultural evolutionary theory required for explanation. Nor has any serious attempt been made to fix the point in time at which human evolution became so significantly purposive that a *blind* model of variation and selective retention is no longer adequate as the explanatory device.

Modern humans, armed with science, have come to possess considerable insight not only into immediate problems of adaptation, but into larger aspects of evolutionary process. These insights, coupled with a conscious desire to survive and flourish, have allowed humans to interfere actively in the process of evolution itself, in a significantly sophisticated and purposive way. Such behavior has been aimed at problems of natural ecology (e.g., conservation of energy and other natural resources), problems of political ecology (e.g., regulation of international political relations in war and peace), and with problems that involve both of these areas (e.g., imbalances between subsistence possibilities and population).

While it is fashionable to disparage contemporary purposive efforts, such as the assessment and manipulation of environmental impact or control of the potential for nuclear disaster, there can be no doubt that purposive efforts in these directions have made and will continue to make a difference in the adaptive possibilities, probabilities, and outcomes experienced by human groups. These outcomes are of enormous potential importance to the continued adaptive effectiveness of human populations—and possibly to their very survival. Because such purposive and insightful interference into the very process of evolution anticipates and bypasses natural selection processes, this kind of conscious, intentional meddling will be termed "rational preselection."[1] It is assumed that there will be no disagreement that modern industrialized human beings practice preselection purposively, with some significant degree of impact upon their adaptations.

In this paper, the current state of cultural evolutionary studies is taken as a starting point to ask two related questions. First, as a practical instrument of human adaptation, has there been a role for preselective behavior in the mechanics of sociocultural evolutionary process *before* the advent of modern science and scientific theories of evolution? Secondly, have there been any particular points in the natural history of humanity at which preselective capacity itself became markedly selected for, in human (or hominid) populations?

These questions are asked with two problems basic to anthropological theory in mind. One is that theories of cultural evolution take far too little account of rational preselection. The other is that current definitions of culture that emphasize native[2] rationality still are extremely unspecific as to the mechanisms through which this rationality operates to solve problems. This paper is written on the assumption that an attempt to answer the two natural-historical questions posed in the preceding paragraph should lead to critically needed revisions in theory of cultural ecology and of sociocultural evolution and to significant strengthening of the culture concept itself. I shall specify many of these revisions in subsequent sections.

In advancing a radically modified, *processual* approach to the understanding of cultural evolution, it will be necessary to take a close look at group and individual decision making as the locus of rational inputs into adaptive process. As Fjellman (1976) has emphasized, the study of natural decisions is in its infancy. Later on, some concrete suggestions will be made for advancing this field of study methodologically and for integrating the study of decisions into the proposed processual analysis of adaptive behavior.

In developing the broader context needed for the understanding of the place of rational decisions in adaptive activities, two promising theories are available for judicious borrowing and adaptation: (a) the blind variation and selective retention model of

biological evolution based on population genetics and (b) general systems theory. The first step in constructing a more efficient theory for biosociocultural evolution is a difficult one. This is to evaluate the meanings of the terms "purposive" and "goal seeking" as these are employed by biologists, cultural anthropologists, and systems theorists.

PROBLEMS WITH "PURPOSE" IN SYSTEMS THEORY AND IN BIOLOGICAL EVOLUTIONARY THEORY

Problems of Semantics

Without dipping too deeply into the philosophical can of worms labeled "Theories and Counter-Theories of Determinism," the meaning of "purpose" in a strictly evolutionary systems context will be clarified here. The problem is that the terms "purposive" and "goal" are ambiguous as used by biologists, systems theorists, and social scientists with regard to nonliving and living systems. While we all know that heat-seeking missiles or lower forms of life possess no intrinsic conscious or unconscious *intentional* grand designs, such systems are generally described in a metaphorical "teleological" language. I believe that even when used with sophistication, this metaphor still breeds some subtle but pernicious confusion.

What this metaphor helps to obfuscate is the quite sharp difference between these two types of systems. First, there are the self-organizing living systems that survive effectively because of a fit with the external environment based on past processes of variation and selective retention, which are wholly blind. On the other hand, modern human adaptive systems possess a supplementary, rational, preselective mechanism that is clearly purposive, in terms of intentions to modify environmental adaptations in complex ways. These purposive intentions are accompanied by the technological expertise needed to succeed sometimes in implementing these intended modifications. So far, this contrast has not been taken account of adequately in the formulation of theories of cultural ecology or of cultural evolution.

Contrasting Teleonomic Systems with Rational Preselective Systems

These two contrasting types of evolutionary process may be differentiated unambiguously. First, some living systems are purely "teleonomic," in Mayr's (1974) sense, in that they blindly adjust themselves in adaptive directions through "programs" based on past blind interactions with the environment. These adjustments are so heavily determined by the genetic codes of individuals that consciousness and intention may be assumed to be nonexistent or without any special effect. At the other extreme is the rational preselective system. Here, the creatures of evolution have come to understand enough of their own adaptations that they may sometimes anticipate potential outcomes and try to select, or "create," favorable adaptive solutions *in advance of blind natural selective effects.* This occurs when negative feedback is recognized and reacted to and potential sources of variation are present.

Blindly teleonomic adaptive systems possess *none* of the high-level intentional and purposive features that are characteristic of preselection. On the other hand, in all systems distinguished by the presence of preselection, blind variation and selective retention *always* continue to operate alongside the rational preselective process. In this respect, it is safe to say that no human group totally understands, let alone controls, its entire environment.

Both teleonomic blind evolution and evolution with rational preselection share this important feature: neither is in any way teleological[3] in the sense of *final cause.* That

is, there is no purposive grand design inherent in either kind of system. Even the preselective type is still a product of, and ultimately is subject to, the blind evolutionary selective processes designated as teleonomic.

It is to be emphasized at the outset that rational preselection is only a fallible process, through which creatures of evolution *attempt* to meddle in their own evolutionary destinies. For example, the view that contemporary preselection is fallible may be exemplified by the appropriate anxiety most people feel concerning the potential inadequacy of nuclear arms controls with respect to survival of the species. But however fallible it is, rational preselection in the long run is assumed to have produced an adaptive "batting average" superior to that of teleonomic natural selection process alone. For example, under a wholly *blind* natural selective process at the political level, nuclear arms proliferation, were there no effort at all made toward control, would lead to a prediction of still less chance of survival for the human population of planet earth.

Level of Selection

In Richerson's (1977) extensive and thoughtful treatment of what he calls teleology in biological and cultural evolution, he limits behavior based on rational decisions to the individual level and warns against uncritical application of "teleological" theories to higher levels, concluding that "the exact locus of purpose-generating process or design is still problematic in biological and human ecology" (1977:21). The key process in both fields is "natural selection, operating on the variable genetic and cultural information contained in individuals . . ." (1977:21). However, I believe that limitation to interindividual competition most emphatically is not true of preselective adaptive behavior. Individual genetic competition is a very powerful theory for explanation in biological evolution. But when the transmission of adaptively useful information becomes significantly cultural, then selection at the group level must not be arbitrarily dismissed in seeking processual explanations. Even when the animals involved are not human, the question of selection at the group level must be raised with an open mind if cultural traditions of different groups in the same species are significantly variable.

With preselective systems, it is sometimes the capacity to combine the information possessed by a number of highly experienced individuals, combined with the political organization necessary to effect decisions at the group level, which makes it possible for a relatively large social unit to embark rapidly on a significantly different adaptive course. But even when preselective change takes place more gradually and mainly at the individual level, it is usually the adaptive fate of at least an entire domestic group that is involved.

ADAPTIVE DECISION MAKING IN HAMADRYAS BABOONS AND MODERN *HOMO SAPIENS*

If modern *Homo sapiens* is definitely capable of rational preselective behaviors that must be accounted for as mechanisms in evolutionary theory, the question must be asked as to when such mechanisms began to develop in living systems. Later on in this article, earlier human evolution will be considered, but there we must rely upon inferences based on the fragmentary kinds of remains that archaeologists study. To begin with, it is preferable to ask a question that may appear to be outlandish. Given the definition of preselective goal seeking developed above, do highly social, large-brained creatures such as baboons go about their adaptations in a way that may be termed preselective? Here, at least, we have a thorough firsthand description of behavior.

In considering whether a troop of Hamadryas baboons is a blind, teleonomic adaptive system or an adaptive system capable of preselection, we may rely upon the excellent descriptions of Kummer (1968, 1971), who describes the social life of the Ethiopian Hamadryas, which "roost" along the faces of cliffs and utilize an extensive desert home range. Kummer depicts the interaction of a large troop on the verge of setting out toward the day's foraging grounds and water sources. Because the reader may be skeptical of my interpretations, I shall quote Kummer's generalized field description extensively:

> At around eight or nine in the morning, the occasional shifts of groups on the slope become more frequent. Here and there, an adult male scratches, gets up, and moves toward the periphery of the troop to sit down there, his females following him. If one carefully maps these shifts, it becomes apparent that the males pay much more attention to each other than superficial inspection indicates. The shifts of neighboring males are highly interdependent. If a particular old male moves in a certain direction, the surrounding males, after a minute or two, turn on their buttocks to face the direction in which he has gone, or execute a parallel shift. A young male may make a similar move without obtaining any such response from his neighbors and he may soon after return to his former place.
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> During this process, the males are as silent as before, but their obsessive scratching before nearly every change of place betrays the conflicts to which the multiple interaction subjects them. The process, in fact, is an important decision process about the direction of the daily foraging trip for which the troop now prepares. This is almost exclusively an adult males' affair. The group males, who never groom one another, now begin to interact openly before or after certain shifts. Often a male gets up, walks over to his neighbor hesitantly, presents his brilliant red buttocks in a rapid turn, and then hastily retreats again as if he has approached his neighbor too closely—which he did, if compared with the usual distance between group males. Contextual analysis suggests that this peculiar presentation probably functions as a notification to a neighbor of one's imminent departure, a signal that seems to say, "Watch out, I'm leaving now—in case you want to follow."
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> As a consequence of the ever more frequent shifts, the troop changes its shape like an amoeba. Nobody has departed yet, but here and there the troop's periphery protrudes in a kind of pseudopod which may persist or withdraw again. After perhaps half an hour, a number of male baboons in the center of the troop finally get up in quick succession and walk toward one of the pseudopods. Their straightforward walk is quite different from the previous hesitant shifts at the periphery; many animals begin to move in parallel direction, and suddenly the troop is on the move. It is reasonable to assume that the pseudopods were proposals for particular directions by peripheral males, and that some influential male near the center finally made a decision. On another morning, a different male may initiate the departure. The troop, which now leaves the cliff rapidly and in a dense column, is clearly not led by any one particular animal. The baboons at the head are constantly replaced, and it looks as if everyone knew the direction of the march [1971:24–25].

This portrait in its visual aspect alone suggests a cybernetic system, in which the social subcomponents and their potential interrelations are reasonably apparent. But if this system of decision making is to be viewed as fully cybernetic, it must fulfill the additional criterion of reacting to various kinds of feedback from the environment. Here we have a problem, in that it is so difficult to make inferences concerning how nonhuman animals synthesize highly complex information, make predictions, and communicate with one another.

In spite of this magnificent description of the visual aspect of baboon decision making, Kummer conservatively maintains that communication among baboons is in the here and now, never for the future (1971:32). However, elsewhere, with regard to the function of tradition within nonhuman primate society, Kummer implies that baboons do use the past to predict the future:

> Some environmental situations such as drought are too rare to permit a direct experience for every troop member. In this case, an experienced oldster may be the only animal in the troop

> that has the adaptive response—which is to travel to a certain lasting waterhole outside the usual home range and thus inform the younger members of its whereabouts. Tradition here requires a long life expectancy and a leading role for the older animals. It is also advantageous if a single experience is sufficient for establishing the adaptive behavior [1971:126].

If one puts all of this information together, it would seem that Kummer has overstated his case for the limitation of nonhuman primate communication. In terms of nonverbal communication,[4] the dynamics of a troop of baboons getting ready to move out for the day may convey no explicit information concerning specific locations of subsistence resources. Yet the process is informed by such predictive knowledge and abetted by the fact that greater age and dominance correlate in such a way that the more experienced male animals—the ones that have had the most opportunity to explore the terrain within and outside the home range—are able to lead the troop.

Elsewhere, Kummer (1968:139-140) gives further support to this notion. Four out of 26 departures deviated from the generalized description above, in that a single male (not always the same one) adopted a unique swinging gait and, ignoring the indications of the pseudopods, almost instantly galvanized the entire troop to march decisively in a certain direction. In only one case was the basis for such behavior obvious:

> In one of the four departures marked by such a starting march, a single pseudopod had formed in the direction most usually taken by the troop. On just this particular morning, however, the usually dry river bed at the foot of the cliff was flooded and the route was inaccessible. The starter now directed a departure toward the southeast, a rarely taken but unobstructed direction . . . [Kummer 1968:139].

The overall process appears to consist of decision making and decision implementation at a group level, and is a way of planning vital activities for an entire day on the basis of a great deal of information, a supposition supported by the Altmanns' findings (1970:98). In a desert environment, the planning of migrations is crucially important. Much energy must be invested simply to reach a given part of the home range from the sleeping place, which is a refuge from nocturnal predators. When things are ecologically tight and water holes begin to dry up, it seems certain that these decisions are crucial for the survival of some or many members of a troop. But if it is agreed that these acts of leadership have to do with the activities of an entire day, we still may only speculate as to what this "means" consciously to baboons while the pseudopods are forming.

To summarize, the following generalizations may be made on the basis of Kummer's studies of Hamadryas baboons:

1. They live in segmentary societies capable of fission and fusion in accordance with environmentally determined exigencies that have forged their ecological and social adaptation.

2. They possess a great deal of information concerning their environment that is vital for survival. This information comes out of individual experience and is not primarily a genetically determined response to environmental pressures that merely "looks as if" it were based on such information. A large brain with good memory capacity and ability to synthesize information and act within a complex and variable social context is what genetics has provided the baboon, and the best-informed dominant adult males take it from there.

3. Hamadryas baboons at the troop level make decisions aimed at acquiring an adequate subsistence. Troops decide on a travel plan for an entire day out on the semidesert, where resources are relatively thinly distributed, and travel time and energy expenditure are significant factors. To this extent, they may be said to be thinking about ecological possibilities, making predictions, communicating these predictions, making decisions, and acting on decisions concerning those aspects of ecological adaptation that are obvious to baboons.

It is possible that the motivations of males central to decision making are wholly "individual," that is, oriented to satisfying individual needs. But the facts that they exert leadership in initiating travel and that there exist other role specializations affording vital services to the group by individuals suggest otherwise. Leader-sentinels, who are almost instantly replaced when they die (Kummer 1971:58), are the most clear-cut example. While there is likely to be a fairly specific biological basis for such behavior, we have little idea as to what a large baboon brain is doing as the male sentinel is engaged in his duty. Since it is very difficult to discuss altruism, which properly is a matter of motivation, in creatures whose motives are empirically inaccessible, the matter must be left as an open question.

Leaving aside the issue of possible "altruistic" motives, Hamadryas baboon society is structured so that vital group decisions sometimes are made through a process that involves thoughtful purpose both in generating *variation* and in final *selective* behavior. The information processed by leading males, and their ability to come to decisions that guide group activities, together have adaptive value for the entire troop. Thus, some quite complex adaptive problems are decided upon *by the baboons themselves,* at the relatively long range of an entire day. This is a limited but valid case of group level *preselection.*

Because the capacities of baboons in memory, synthesis of information, and decision making about the natural environment are only partially studied, it is difficult to speculate further as to precisely how mature males respond to negative feedback from the environment. But the flexible nature of social patterns in adult Hamadryas and other baboons is well documented and suggests a potential for relatively rapid and flexible responses to negative feedback resulting from environmental change. This distinguishes baboons from other animals possessing adaptations relatively more fixed by genetics.

Applicability of the Baboon Model to Homo Sapiens

Kummer's brilliant description and interpretation provide a tantalizing point of departure. This is probably as complete an account of large-scale decision process as exists anywhere for primates (including humans) below the level of modern technological society. Apparent are the troop's systemic properties, and particularly obvious are sources of variation and modes of selection in the social process of coming to a decision. These are linked to a capacity of the entire system, as a well defined group, to react to negative feedback from the environment at a nongenotypic level. The somewhat crude but "natural" cybernetic model I have inferred from Kummer's analysis will be exploited now in three directions with respect to preselection in *Homo sapiens.*

First, the role of rational decisions for contemporary nonliterate natives will be clarified, in order to develop a more effective processual model to explain adaptations to natural and sociopolitical environments. To do so, specific proposals will be made for the redefinition of culture, after current anthropological studies concerned with native rationality have been discussed. In being general, this processual model is expected to apply to all human beings and to certain other highly intelligent and intensely social animals possessed of cultural traditions. Secondly, this assessment of the place of rational decisions in contemporary adaptive activities will be extended back into prehistory. In attempting to place preselection in its natural history context, I shall speculate concerning some particular points at which major developments in preselective capacity may be inferred from significant changes in the rate or quality of biosociocultural evolution. Finally, an approach focused on rational preselection will be refined and made more specific, through development of an appropriate methodology and discussion of possibilities for falsification.

CURRENT ETHNOLOGICAL VIEWS OF HUMAN PURPOSIVENESS

With respect to rational activities specific to adaptation, I believe that most anthropologists, following Malinowski (1948), give nonliterate natives considerable credit in this area. However, with respect to theory, the rational decision-making capacity of natives has by no means been taken fully into account, and methodological neglect is serious. In this review of anthropological literature most relevant to the study of rational preselection, I shall begin with theory and move gradually in the direction of description.

Theory of Sociocultural Evolution

To begin with grand theory, the recent debate spurred by Donald T. Campbell's (1975) presidential address to the American Psychological Association served as a stimulus to theoretical introspection by anthropologists interested in conceptualizing sociocultural evolution. Campbell in that publication chose to emphasize heavily the blind aspects of sociocultural evolution. In the several dozen responses to Campbell's many-faceted essay, only two anthropologists (Boehm 1976, Goldschmidt 1976) took issue with Campbell's position, to argue that human adaptive behavior is sometimes significantly purposive.

In an earlier publication, Campbell does come out for rational selection, at least in modern societies:

> For these, the social group's knowledge of social process and its estimate of external selective factors would be employed as a substitute for the real selective factors, in an effort to think out in advance the relative adaptiveness of alternative cultural changes [1965:31].

Although restricted to modern state level societies, the above passage comes very close to defining preselection. Campbell also offers a highly appropriate note of caution: the fact that a social institution has the appearance of being a "rational" solution to a complex problem need not be taken as evidence of such planning (1965:31).

Later, in a limited context, Campbell (1975:1106) extends rational selective faculties to prehistoric humans, to whom the advantages of one form of weapons technology over another may have become "perceptually 'obvious,' " a phrase that will be borrowed for the present analysis. But basically Campbell remains conservative with respect to giving rational selection a major role in sociocultural evolution.

Cultural Evolution

Cultural evolutionists following White (1959) are comfortable with a theoretical stance in which only the material aspects of environmental adaptations are taken into account as independent variables. The advantage of such an approach is that the variables measured lend themselves to quantification, and typologies and theoretical models may be borrowed quite directly from biological approaches to ecology and evolution. But Flannery's characterization (1972) of cultural evolutionary approaches as top-heavy in the typological department is a just criticism, in that process has been neglected. According to Flannery (1972:404), anthropologists who openly espouse evolutionism, particularly those who have been concerned with the problem of state origins, have been preoccupied with typologically based synchronic "Just So Stories." Flannery does not go into detail, but one may assume that he refers to the camp represented by Service and Fried.

Fried, writing as a good cultural materialist, sees a special case in Maoist China, where "political will coupled with total power can alter culture according to human designs" (1964:61). No such idea emerges in his later treatment of state formation (1967:227-

242), and earlier he states definitively that the movement to pristine state formation takes place so slowly that the cultural carriers themselves are unaware of the change (1960:714).

Service, on the other hand, does mention "purpose" in proposing that evolutionary studies look to "relations with other societies as well as with geographic features in examining environmental adaptations" (1975:319). In outlining the way that state formation takes place as a process, Service emphasizes the advantages of a centralized bureaucracy as a special mechanism that "can better direct itself, and can purposively solve adaptive problems more expeditiously, than can the simple elements in a biological selection-survival equation" (1975:320). Service links this capacity to the ability of states to grow and expand, but points out that success breeds stabilization and "an increasing inability to change in response to new environmental conditions" (1975:320).

The main point is that theocratic bureaucracies over time become brittle, but Service's use of the term "purposive" here would seem to push the idea of rational preselection from the present back to Sumeria and Egypt, in their developed state forms. It would seem that he is limiting purposive adaptation to florescent periods in state-level political systems possessing well developed bureaucracies. But, because this concept of adaptation is not elaborated further, nor employed in any of his detailed analyses, it is difficult to interpret this important notion any further.

Other cultural evolutionists interested in state formation either have been unaware of the potential issue of indigenous adaptive purposiveness, or have chosen not to take this problem into account; instead, they deal in single mechanical variables such as population pressures, subsistence pattern, trade, geographic location, social stratification, etc., or else in combinations thereof. Cohen (1978) suggests that such unicausal explanations of state formation have proven infertile and emphasizes the role of centralized bureaucracy and "dominant control of force by the central authority over subordinate segments of the society." But he does not link this to preselective behavior, preferring a multicausal analysis of external, blind variables.

Even though Cohen does not speak of purpose, the variables he chooses to emphasize still would be most important, were there a human purposive element in state formation. Once a purposive innovative decision is made, its implementation (as Fried implied) can be effectuated with relative ease by means of coercive force, even if the innovation goes against the conservative, stabilizing forces of cultural tradition or against the rational dispositions of the population at large.

If we look at the combined positions of the American cultural evolutionists, they appear to be on the verge of saying that centralized and effective coercive political power, coupled with a rational adaptive decision-making capability, may make radical experimentation in the natural and political ecological fields possible. But to date, they have not ventured to hypothesize that a rational appreciation for advantages of incipient centralization could intensify the centralization process.

Some British scholars have been less reluctant to think about the purposive potential of humans. Reynolds (1973:468-469), thinking in terms of a science of human ethology, emphasizes in a restricted context the importance of human predictive capacity for action based on idealized models. Reynolds sees nonpurposive social system variables as the crucial independent variables in state formation, using insights derived from primate ethology, where increased population density results in intensification of dominance relations (1973:473). But he carries his sketch of human adaptive capacity to a point of purposiveness that goes far beyond what most American cultural anthropologists have been likely to project:

> It is this human characteristic of organizing the data of life into a meaningful conceptual framework, a hypothesis of reality, and the capacity to imagine better or ideal models without

> experiencing them, which must be seen as the main instrumental factor in initiating purposeful changes in subsistence methods or in social systems; and it is also the main factor of variability in the different populations, even when facing similar sets of circumstances [1973:471].

This capacity is seen as applying only to civilized humans. But, in the total range of stands taken on evolutionary purposiveness, it is very far toward the preselective.

Reynolds does not draw any broader conclusions for evolutionary process itself, nor specify the exact mode(s) of decision making. Bray (1973), in discussing the biological basis of culture, mentions only in passing Herskovits' labeling of human inventions as "purposive discovery" (1945:151), a term not defined any further by Herskovits, then leaves the problem to the philosophers, probably the very approach most unlikely to produce needed clarification.

This brief but representative survey of cultural evolutionists and their stances on the issue of preselective purposiveness indicates that this capacity may be attributed to modern *Homo sapiens,* especially where coercive power and political centralization are abundant. At least a few scholars see such purposive phenomena as likely or possible at the early state level, but it is not taken into account in their analyses in any very serious way. As for humans living in prestate societies, no mention is made by these scholars of the possibility that they are capable of preselection. The same, of course, goes for nonhuman primates.

Cultural Ecology

Steward, in setting up typologies that explain particular adaptive routes, depends heavily upon core variables that are material, although he includes "religion" (in the narrow sense of ritual) in his culture core related most closely to adaptation (1955:37). Values, cognition, and rational decisions are not given a prominent place. Rappaport, in his study of New Guinea ritual, suggests at the end of his book that the ways in which the Maring "cognize" their environment may be worth looking into, as a suggestion for future research into the role of what he calls "ideology" in adaptation (1968:241). This interesting possibility is pursued by Rappaport (see Addendum), while later writers such as Johnson (1974) have begun to take interest in such possibilities (see Fowler 1977).

Goldschmidt (1971) emphasizes the theoretical importance of decision making in connection with Edgerton's (1971) psychological research on East African tribes having adaptations that are either predominantly pastoral or predominantly agricultural. While some information directly concerned with decisions was elicited (Edgerton 1971:311), the thrust of Edgerton's research was in a different direction. For that reason, and because the sample of societies was not sufficiently bi-polarized, Goldschmidt's assertion that pastoralists develop and exercise decision-making capacities to a greater extent than agriculturalists must be taken as a preliminary hypothesis.

With respect to Goldschmidt's interesting hypothesis, I believe that such differences may be brought into sharper relief if we compare nomads with people who are sedentary. In relatively unpredictable environments where sedentary adaptations are impossible, the selection of migration routes takes place frequently and often may involve considerable novelty in decision dilemmas. There is some empirical evidence to justify this assertion.

In his study of South Persian nomads, Barth (1961) describes the highly euphemized decision process through which a large patrilineal kin group negotiates the next move of the camp, a decision that may quietly approach crisis proportions when natural resources are particularly scarce. The various domestic units feel torn between the goals of (a) maximizing the health and productivity of their respective herds through social segmentation and spreading out to exploit more territory and (b) keeping the social

group at its normal size so that the kinsmen may continue to live in close contact. The problem is severe, in that if a group separates in a time of scarcity, it may be years before its constituent segments will be close enough to unite again (Barth 1961:26,43). This description of Barth's may well be the best that we possess, with respect to the actual process of natural environmental decision making.

Gulliver (1951:117) also has documented the need of pastoral nomads to make complex and novel decisions frequently, with respect to migration routes. I believe that a similar situation exists for hunters and gatherers, where their adaptation is to a highly variable environment. Nomadic groups such as gypsies appear to conform to this pattern as well.

Routine Innovation

The subtler side of rational innovation at the technological level has been defined and studied by Merrill (1959). He differentiates innovations requiring great amounts of creativity from decisions involved in a process he calls "routine innovation." This consists of practicing a well known cultural skill and rationally making the fine adjustments that are necessary to apply any skill to specific problems, which always are subject to some variation. While Merrill focuses upon technological traditions, he suggests that ongoing moral processes may be another locus of routine innovation (1959:87).

Merrill's notion of routine innovation partly contrasts with preselection, but primarily overlaps it. Routine innovation may be simple or complex and involves the application of well known and specific skills to rather immediate problems. On the other hand, preselection may be viewed as the exercising of a relatively more generalized problem-solving skill to cope with complex problems in adaptation. When the problems are very familiar and complex, routine innovation and preselection are one and the same process. However, preselection sometimes involves coping with relatively novel problems or problems that extend well beyond the immediate situation, in that they involve the natives in a predictive assessment of their own long-term chances for survival or for maintaining an effective adaptation. Merrill's conception is very useful, because it provides a means of studying rational decision making directly at the microlevel and emphasizes the dynamic nature of what appear to be quite stable traditions, by viewing these processually.

Economic Anthropology

Fjellman (1976) has pointed out some major problems with formalist approaches to the study of decisions but has made no concrete recommendations for developing new methods and theories. It is my contention, in agreement with Howard and Ortiz (1971), that what is needed is the intensive and direct study of natural decisions, as a focal aspect of preselective process.

Curiously, economic anthropologists have devoted a great deal of attention to native decisions yet have scarcely ever focused on the decision process directly, i.e., through detailed ethnographic reporting on natural decisions as they are made. The so-called "formalists" have borrowed an explanatory model of rational choice from economic theory, in which the individual actor knows "everything there is to know" and then acts to maximize utility in making economic choices. One characteristically measures the outcomes of choices, in order to speculate on the basis of choice at the individual level. A number of anthropologists have conducted impressive field studies using this kind of theoretical model, both with respect to microeconomic choices (e.g., Ortiz 1967, 1973; Barlett 1977; Rutz 1977) and with respect to rapid responses to macroproblems such as migration decisions in modern nations (Britan and Denich 1976). From the standpoint

of developing preselective theory, this is an important movement in anthropology, and because formalist anthropologists are also ethnographers, their theoretical apparatus does not preclude their having considerable insight into the decision process itself, including native cognitive assessments and values (e.g., Ortiz 1967:213-225).

Rationality in Change and Stability

Culture change has been studied from many perspectives by anthropologists, and rationality is explicit or implicit in many of these approaches. I shall not attempt to discuss this sprawling literature in a format as limited as the present one, but one particular area in which preselection has received special attention at the ethnographic level concerns the problem of "cultural conservatism."

The rationality of natives who recalcitrantly resist innovation has been studied by Ortiz (1967) and others, with the finding that natives faced with pressure to innovate do not resist blindly, but calculate very carefully the costs and gains on both sides of a dilemma. It was inadequate assessment of native rational capability and incomplete understanding of the native values that inform such decisions, that allowed the "blind traditionalism" image to flourish for so long. Ensminger (1977) has drawn together the small but, I believe, very significant literature that is pertinent to this question, with respect to both agricultural and pastoral adaptations.

Decisions in External Political Adaptations

Curiously, the ethnographic literature simply abounds with generalized descriptions of "tribal" or "egalitarian" political decision processes, at the same time the decisions themselves remain all but undescribed from a processual standpoint. One notable exception is Meggitt's (1977) very detailed study of warfare among the Mae Enga of New Guinea. While Meggitt explicity disavows any intention of indulging in higher level theoretical explanation, the description is superb and sophisticated. A rather large section of the book is devoted to decisions, i.e., to the contexts of native goals and strategies and the ways in which groups arrive at decisions to raid or go to war. Meggitt's analysis demonstrates that it is possible to secure good primary data on group decisions through normal salvage-ethnographic techniques of elicitation.

In spite of his vow to eschew theory, Meggitt comes up with an important finding: the natives are consciously aware that warfare lends itself to the acquisition of territory. Meggitt himself evaluates this indigenous theory as being both rational and in keeping with the assumptions of "cultural materialist" evolutionists (1977:viii).

In a study of my own (Boehm 1978), I have described ethnographically a Slavic Balkan segmentary tribal system having a refuge area adaptation, in which each tribal segment has a regular, consensual mode of reaching agreements with respect to self-defense, aggressive warfare, and management of tribal lands and conflicts within the tribe. Using ethnohistorical materials, I have been able to isolate the values determining the goals that set up dilemmas for the individual Montenegrin tribes or for their confederation when it acted as a corporation. I have also been able to assess the informational context in which the natives pondered (and debated) their political decisions.

That analysis is devoted to developing the preselective hypothesis at an empirical level, with respect to external political adaptation. The conclusion is that for these tribesmen there is a high degree of rational input into the selective process in dealing with both routine and novel threats from the Ottoman Turkish Empire, and that these inputs definitely affected practical political outcomes in a direction that increased the effectiveness of adaptation, but also increased the possibility of genocidal extinction.

Decisions in Internal Sociopolitical Adaptations

Goldschmidt (1959) argues strongly for the existence of a "conscious" element in human innovation at the societal level. He discusses the Code of Hammurabi and a documented case of the Cheyenne creating a new legal institution (1959:122-123), both of which may be classified as novel innovations. I believe this position is in close concert with the massive findings of legal anthropologists, in which conflict management is viewed as an activity through which internal social adaptations are manipulated deliberately in the interest of social harmony. An example is the type of blood feud system discussed by Black-Michaud (1975), in which the linked problems of homicide and intergroup conflict are dealt with through rational mediational means entailing exact quantification on the parts of the natives.

I would extend this characterization to suggest that the everyday conditioning effects of moral systems also are often accompanied by a conscious realization that the individual behaviors being suppressed are socially deleterious in a practical sense. Thus, the routine informal or formal direct sanctioning of individual behavior by other individuals or groups is often accompanied by a rather good understanding by the natives of the functional prerequisites of a smoothly operating society (see Boehm 1976).

Problems and Possibilities

This brief survey suggests that cultural evolutionists variously deny, question, or merely identify the importance of native intellectual capacity in cultural analysis. Many other ethnographers casually refer to decisions the natives make, without trying to account theoretically for native problem-solving capacity in any significant way. In this respect, Malinowski was the notable exception. A few others, like Barth and Meggitt, have focused upon decisions descriptively to make valuable and astute assessments, but do not go far beyond their own unexamined intuitions in dealing with these decisions at the level of explanation. Merrill's useful approach brings the advantage of processual study of microdecisions, which requires a dynamic conception of culture. I should also mention here those anthropologists who have been concerned most directly with studying the ways natives think. In general, psychological anthropologists, ethnoscientists, and philosophical anthropologists have failed to articulate their sometimes impressive findings beyond generalized structural descriptions, taxonomic catalogs, etc., which leave the practical adaptive side of indigenous knowledge and sophistication relatively unstudied. The ethnoscientists will receive some attention in a later section.

Of the economic anthropologists who have taken note of native decisions, some "formalists" use such an antiseptic conceptualization of the omniscient native who makes maximizing choices that the model has little relevance for real decision behavior. However, I have discussed as well the small group of economic anthropologists who are beginning to look more carefully at native rationality as this rationality is exercised directly in adaptive decision-making contexts. Suggestions of Howard and Ortiz (1971) for developing the formalist model to account for ways the natives "really think" will be considered in the discussion of methodology for studying preselection.

DEVELOPING AN APPROPRIATELY PURPOSIVE THEORY OF BIOSOCIOCULTURAL EVOLUTION

Preselection and an "Evolutionary" Definition of Culture

At this point, it is appropriate to suggest a minimal conceptual starting point for the definition of "culture." In more than a vague or general way, such a definition must be accommodated to the fact that all living systems are subject to evolutionary adaptation:

> Culture is a body of knowledge and values, signs and/or symbols, shared by different individuals at least some of whom live together socially, which is transmitted from generation to generation through individual learning processes. Culture contains organized information, much of which comprises a successful response to past problems in adaptation. Culture is important as a conservative retentive device which supplements the retentive function of the gene pool. But it also possesses its own independent organizational properties, which may serve not only as a source of variation but through the operation of cultural values may function as an agent of selection as well.

This definition allows the reader to make an individual choice as to whether the implied cultural system of adaptation contains significant preselective elements.

In applying this definition to the behavior of the more intensely social of the higher primates, the only component in question is the existence of "values" at a cultural level. It is, of course, by the operation of shared values, as well as through symbolic communication and use of information, that group level preselective behavior is actualized. To exemplify, this applies equally to Kummer's baboons (if in fact they conceive of success in their day's subsistence trek) as it does to recently pristine nonliterate human groups that mobilize themselves to resist the threat of European expansion, or to a modern society trying to work out a long-range policy on energy. With humans, of course, verbal symbols supplement nonverbal communication and permit a much more precise mode of information exchange.

Systems Theory and Evolutionary Purposiveness

Deutsch (1968) has helped to clarify the general applicability of systems theory to living organisms and to purposive humans. He sees electronic communications networks as offering *analogies* for "purpose," "learning," "consciousness," etc. (1968:390), a position with which I strongly agree. Crucial importance is given to the feedback component, defined as

> a communications network which produces action in response to an input of information and *includes the results of its own action in the new information by which it modifies its subsequent behavior* [1968:390-391, emphasis added].

This is an exact model for what takes place in a preselective process. The model takes into account time, information, and feedback (Shibutani 1968:335), so it is processual. It is also adaptive (Sommerhof 1968) in that an appropriate system response is one that abets survival in an environment through use of information in that environment.

Buckley's adaptation (1968) of the systems approach to total sociocultural systems in their biological and ecological dimensions demonstrates well the complexity of such systems; he also emphasizes the importance of *meaning* in conceptualizing them. This view has the advantage of being freed of the unhealthy preoccupation with homeostasis and continuity over time, which has characterized so much of the structural-functional tradition in sociologically oriented anthropology.

Buckley's focus on conflict, competition, and deviation within the human social group is useful for understanding sources of variation in adaptive decision making as portrayed in this essay. However, systems functions in group adaptive process that are homeostatic are important and must be specified as exactly as possible in terms of mechanisms. Cultural tradition with the backing of morality has been pinpointed (Keller 1931; Waddington 1960; D. T. Campbell 1975; Boehm 1976, 1977) as the basic retentive mechanism for cultural systems.

In speaking directly of adaptation, Buckley (1968:494) rightly emphasizes the rapidity

with which cultural systems may adapt, due to extrasomatic storage of the mappings of many individuals. But, Buckley sees the feedback loops in cultural systems as being so "long and tortuous" that knowledge of results ". . . may be easily interpreted in non-veridical ways (as the history of magic, superstition, and ideologies from primitive to present amply indicate)" (1968:496). Later, I shall take issue with this last assumption, at least so far as certain more astute and knowledgeable leaders of nonliterate groups are concerned.

It would appear that systems theory is admirably suited for modeling the adaptive process of living systems, including cultural ones. It is also well designed to account for the fact that decisions take place continuously in human cultural adaptations (Buckley 1968:507-508). However, as will be seen in the next section, the adaptive outcomes of preselective living systems are far more difficult to evaluate than are those of teleonomic systems.

Survival and Effectiveness as Criteria for Biosociocultural Evolutionary Success

The position taken in this paper requires redefinition of traditional criteria for evolutionary "success" vs. "failure." In essentially biological evolution, success involves the biological survival and proliferation of breeding populations of distinct species. For human populations, there are many problems in trying to fit the population geneticist's idealized model of a well delimited breeding isolate to the task of assessing the adaptive fates of humans. Elsewhere (Boehm 1976), I have discussed these issues at some length. For one thing, human groups are often quite flexible structurally, and group boundaries within *Homo sapiens* are often both ambiguous and variable in terms of somatological, territorial, social, linguistic, and ethnic criteria. In addition, cultural adaptations not only vary markedly within the species, but may even vary within the same environment. Political-ecological adaptive strategies are particularly ambiguous. However difficult human groups are to define, they may directly displace, dominate and exploit, absorb, or genocidally wipe out other human groups. The most "serious" aspects of intraspecific competition and domination at the group level in most other social species do not closely approach the extremes manifested by the most aggressive human groups (see Lorenz 1966).

Furthermore, "competition" among groups also may be cast in a purely cultural dimension, so that within the species the tradition of one group comes to dominate the tradition of another through intentional or unconscious imitation of the pattern viewed as more successful (D. T. Campbell 1975:1106). Thus, cultural diffusion is an important source of variation upon which both preselection and teleonomic processes operate. Obviously, the political relations mentioned above may play an important part in the diffusion process.

If biological survival is the dominant criterion for adaptive success in biological evolution, then for biosociocultural evolution, the primary success criterion might better be termed evolutionary *effectiveness.* As indicated above, this relates to three domains—the biological, the sociopolitical, and the cultural. Some such conceptualization is needed, in order to modify the biological evolutionary model so that biosociocultural evolution may be conceptualized more efficiently.

The outlines of a processual model for sociocultural evolution have begun to take shape. However, I have said nothing of the role of biology. In the next section the evolution of an increasingly effective preselective potential in the hominid line will be discussed, before I undertake to refine this preselective systems model and suggest a methodology for the direct study of decision behavior.

A NATURAL HISTORICAL PERSPECTIVE ON RATIONAL PRESELECTION

The Problem of Saltations

The development of rational preselective behavior may be hypothesized to have developed most dramatically among highly social animals, where the range of potential adaptive modifications is relatively great, and there exists the political means to alter on the spot the adaptive response of an entire group, when an environmental crisis arises. Kummer's baboons are a case in point. There are also the social carnivores that hunt in packs and depend to a great extent upon previous learning experiences, ability to generalize, and ability to coordinate group action in acting out complex cooperative predatory strategies. If this kind of behavior may be termed preselective or at least incipiently preselective in the sense intended here, then we may assume a continuum of development upwards from a socially similar but presently unknown primate to *Homo sapiens*.

If the level of adaptive purposiveness escalated slowly from limited technological invention and social innovation, at some point there developed a beginning awareness of larger issues in adaptation, based on the evolution of individual and group self-awareness.[5] It is difficult to hypothesize when this may have been. The archaeological record suggests that *Homo erectus* (and also later early humans) for long periods rested on their laurels once a fair degree of adaptive flexibility was attained. A precise point may not be fixed at which human groups, as adaptive systems, came to possess politically influential individuals who were able to function as adaptive consultants possessing radically significant insight into the nature of adaptation itself. But we may begin with the presently unfalsifiable hypothesis that such a capacity had something to do with the ending of the very long period of cultural continuity that preceded the late Paleolithic and made possible the development of systematic domestication of plants and animals and formation of states that followed.

Pushing the available data harder, it may be hypothesized that once Neanderthal burial practices began, and especially after the appearance of symbolic elaboration in mortuary practice, death may have been codified into the cognitive system in such a way that larger adaptive issues became conscious and meaningful to certain leading individuals, e.g., the potential extinction of the social group as a threat posed by the environment. Because a mere beginning has been made in synthesizing and analyzing presently available archaeological information concerning burial practices (see Brown 1971, and in particular Binford 1971), only the grossest general speculations are possible at this point, especially for the earlier late Paleolithic. But since the complex cognitive capacities suggested by Marshak's data (1972, 1976) at least imply that the requisite intelligence was there at that time, there is some basis for estimating conservatively some kind of saltation concerning this preselective capacity to consciously experiment with high-level adaptive strategies at about 34,000 B.C. This is the point at which more elaborate Cro-Magnon cave burials and graphic traditions of notation and animal imagery begin in the Aurignacian, rather suddenly so far as the archaeological record is concerned. This date is favored on the assumption that preselective "interference" in evolutionary process, and increasingly intensive natural selection for more of it, was an important factor in the well documented acceleration of subsequent variegation and development in human adaptive responses in the immediately post-Paleolithic period.

Neanderthal burial and notational practices described by Marshak (1976) and discussed in B. G. Campbell (1976) suggest that this takeoff point might be extended back another 30,000 years into the Mousterian. Particularly in mortuary practice, the regular

east-west spatial orientation, flexing of bodily remains, and use of flowers, animal skulls, and other material in elaborating burials may be taken, obviously quite speculatively, to imply "human conservation" and a "growing sense of the value of life" (B. G. Campbell 1976:353). The Neanderthal level of hominid evolution already may have provided the potential genotypical basis for a high degree of adaptive sophistication, given the very large brain size, and the complex cognitive functions that were at least beginning to be evident by about 60,000 B.P. But picking a possible point at which phenotypically expressed group adaptive behavior became significantly more purposive in some "meta-evolutionary" sense remains a matter for speculation. If the artifactual evidence of Neanderthal mental capacities presented by Marshak (1976) is suggestive, the relative stability of both adaptive patterns and cranial capacity suggest that after Neanderthals appeared, no dramatic new genotypic development relevant to the adaptive mechanism took place until about 35,000 B.P. Thus it is possible that Neanderthal large brains were the result of continuing natural selection for a relatively limited but quite effective preselective capacity that remained for a long time at about the same level.

If there were any relatively swift saltations in human preselective adaptive *potential,* they came quite possibly with the emergence of the Neanderthals, probably later with the relatively rapid physiological and cultural modifications that appear with Cro-Magnon, and conceivably with the later crucial technological inventions of the Neolithic. If a strongly increased manifestation of preselective behavior came with the formation of early states, in all likelihood this would involve a sociocultural and not a genotypical development.

Binford has discussed the post-Pleistocene adaptations of *Homo sapiens* and evaluates the archaeological explanations for that time of change as well. The fact that cultural changes occurred in the absence of environmental change, as well as where dramatic environmental changes did occur (1968:321), does leave an explanatory vacuum when only quantifiable variables are considered. But Binford, discussing Braidwood's (1963) treatment of changes in the direction of domestication, sees Braidwood as espousing a "vital element responsible for the directional series of events . . . inherent in human nature" (1968:322). Binford rejects this explanation as being unscientific.

In rejecting both simple environmental deterministic arguments and "vitalistic" ones as well, Binford himself looks to relations among systems for an explanatory hypothesis. In rejecting Braidwood's use of concepts like "increased receptiveness" and "increased experimentation," Binford (1968:322) is reacting to what I would characterize as a vague use of the notion of culture as a theoretically underelaborated conception of an adaptive mechanism—a notion that cultural anthropologists have handed to archaeologists.

It is suggested that the systems model for a basically teleonomic cultural adaptive system with a growing preselective component may be in part substituted for such vague notions, with greater potential power for diachronic explanation. Employing such a model should at least raise some new questions concerning the potential from which there emerged the rather sudden late Paleolithic cultural hyperactivity that is evident in the archaeological record. If this potential is seen as involving not only new sources of variation, but also a higher level and far more rapidly acting preselective mechanism to supplement blind selection process, then speculations as to the causes of this apparently geometric increase in rate and variety of change may be significantly enhanced. Blind selective pressures in favor of increased preselective *activity* could account for such an exponential curve, in terms of natural selection either at the cultural level alone, or at both the genotypic and cultural levels simultaneously.

The point at which the adaptive effectiveness of living systems exhibiting preselective behavior may have come to exceed very dramatically that of basically teleonomic systems is a line of demarcation that is important in terms of any quantum leaps that are to be

hypothesized in the evolutionary development of cultural behavior. Actually, the level of preselection in Hamadryas baboons suggests that there is no theoretical necessity for an early quantum leap. But the sudden variegation of human adaptive modifications in the early post-Pleistocene provides a later empirical saltation that does demand explanation.[6]

One hypothesis is that preselective capacity was important in the formation of larger hunting settlements, which preceded sedentary agriculture, in terms of guiding effectively the adaptive destinies of larger groups at all three levels of adaptation—the internal social, the natural-environmental, and the external political. Another hypothesis is that politically implemented preselective experiments involving larger collectivities may have intensified rather suddenly, if sedentary agriculture sometimes militated for greater demographic continuity and greater population density for human groups. This increased political potential for group-level preselection may well have contributed in turn to the pristine formation of states. To bring in a different hypothesis, it is possible that this turning point was accompanied by a loosening up of the retentive system for some reason, so that an already potent preselective capacity was allowed more leeway to operate at the same time that more complex problem solving was undertaken in larger groups.

It is hypothesized, then, that preselection itself was increasingly selected for by natural selective forces, at the phenotypical and at least early on at the genotypical level as well, as humans in collectivities became better able to organize information about their environment, to make predictions, to conceive of experiments, and to deliberately modify or even violate their own traditions in the interest of innovation for adaptation. Leaving aside the issue of saltation, the eventual result, when we compare human preselective potential with that of baboons, is a profound change in what Count (1958) calls the biogram.

It is axiomatic to anthropological thinking about "breakthroughs" in the evolution of cultural capacity (see Wallace 1970:41-72) that the advent of complex verbal communication in a grammatical framework was a crucial factor. As far as a preselective hypothesis is concerned, more effective symbolic communication and processing of information appears to be necessary for the dramatic escalation of preselective capacity. In baboons, the level of preselective efficiency is limited by the amount of information concerning the environment possessed by single individuals. The baboons do seem to have a way of permitting an individual who feels certain he has the best information to lead them decisively at times. In more normal direction-of-travel decisions, they arrive at a kind of consensus in which gross directional inclinations are exchanged among individuals, but apparently there is no direct communication of the specific environmental information upon which these inclinations are based. If one adds to such processes the capacity to communicate effectively concerning specifics of perceptually obvious environmental problems, then the adaptive potential of preselection as a *collective* process is greatly enhanced in terms of rapidity, quantity and quality of information synthesis, and the increased predictive capacity that results. Thus, in human evolution, a much more effective preselective process at the group level surely followed upon the evolutionary heels of more effective verbal communication.

Importance of Group Preselection

It must be emphasized that quite often a small amount of limited and *individually based* purposive insight into adaptive problems may significantly change the potential for adaptive modifications of a group. But when environmental instabilities both are very dangerous and become perceptually obvious to the creatures involved, then this

may well increase the likelihood that *as groups* they actively will try to sort through the sources of variation at their disposal to experiment more rapidly and radically with common adaptive policies. To the extent that higher level corporate social segments operate in a given society, the decision process may be assumed to escalate to higher political levels as well. When such mobilization does occur, relatively large groups may compete with other adaptive units on the basis of similar or differing preselective strategies.

Whether a presumed Neanderthal and/or Neolithic preselective takeoff point was the result of intensified preselection more at the individual or the group level remains open to speculation. But the hypothesis advanced here is that more effective political mobilization of groups for adaptive experimentation could have intensified natural selection for improved preselective capability. Development of territorial conflict among ethnocentric hunting groups could have resulted in adaptive decision units well above the domestic group level (see Wilson 1975:573-574). But this would apply even more to the intensified focus on control of fixed territory that probably arrived with sedentary agriculture and the new kinds of political-territorial competition that this may have generated, both matters of political ecology.

Such preselective evolutionary processes may be complicated by the fact that one source of variation upon which preselection operates is "what your neighbor is doing," where this differs from what one is doing oneself (see D.T. Campbell 1975:1106). Imitation or diffusion process conceivably may be so labile in humans that quite rapid preselective adaptive modifications take place at the group level in the absence of group political decision process. But the force of tradition, bolstered by morality, may tend to retard such transformation. I suspect that it is through higher level group political process that tradition may be realigned most rapidly when potential innovation provides obvious and important benefits. Certainly, well documented reports of nativistic phenomena resulting from culture contact are highly suggestive here, for the potential evolutionary importance of rapid and concerted responses to perceived environmental dangers in other contexts at the level of large groups. In the longer run, however, we must look to individual innovation and domestic-group-level adaptive decision making as equally basic and important mechanisms in the process of variation and preselection in biosociocultural evolution. Because such events take place continuously in the ongoing process of adaptation, they are always accessible to empirical research, if perhaps more difficult to isolate.

REFINING THE PRESELECTIVE CONCEPT

The argument developed in this paper began with commonsense intuitions concerning the evolutionary status of modern scientific humans and also a cybernetic model of decision-making rationality suggested by the behavior of Hamadryas baboons. From that starting point, the concept of rational preselection has been developed in the theoretical context of a cybernetic open systems model, combined with the blind variation and selective retention evolutionary model of biologists. The natural-historical development of this rational faculty has been discussed briefly with respect to its possible intensification at certain junctures in human prehistory, and group selection has been discussed as an important evolutionary issue.

A name has been given to this rational adaptive mechanism, and I have discussed the attention *rational preselection* receives in contemporary anthropological studies. Emphasis was placed on the need to take this well developed aspect of human cultural capacity more fully into account in anthropological theory and in the definition of culture itself. To further this aim, I shall suggest here some refinements in the definition

of preselection as an evolutionary mechanism, before outlining a tentative methodology for the direct investigation of native decisions and ending with a discussion of potential falsifiability for the preselective hypothesis developed in this paper.

Rational Selection vs. Blind Selection

In the interest of theoretical clarification, rational preselection has been defined in contradistinction to blind adaptive processes. At this point, it must be reemphasized that preselection, which is rational, operates simultaneously with blind processes and often does not so much preempt those processes as it functions in close interaction with them.

My assumption is that in spite of the efficiency of teleonomic systems, the preselective capacity has been selected for, because, on the average, it increases the fitness of individuals and groups possessing it. In other words, if preselective rationality is empirically present in human adaptive behavior, and if it appears to be adaptively useful some of the time and to be deleterious only infrequently, then I assume it has been selected for (blindly) because of its value for survival. Until preselection has been studied more intensively, and evaluated in terms of its adaptive effects, it will be necessary to make do with this somewhat tautological assumption.

If the hypothesis that preselection is a useful adaptive mechanism is accepted, this does not mean necessarily that a given human adaptive response involves any (or very much) preselection; nor does it preclude the possibility that an attempt at preselection may turn out to be disastrous, even though the natives make it in good faith with the intention of upgrading their adaptation. One assumption I shall make about preselection, however, is that when an adaptive response is heavily preselective and begins to fail, this failure may well become perceptually obvious to the natives, and they may take the opportunity to rapidly withdraw it and experiment in other directions, before evolutionary disaster overtakes them. This may not be possible for purely teleonomic systems when environmental change is very rapid.

Blind Retention vs. Rational Retention

In its parsimony, the term preselection is slightly misleading, in that it appears to favor the *selective* side of rational responses in cultural adaptation. However, rationality inherent in *variation* and *retention* processes is equally a part of preselection. Thus, rational preselection coexists and interacts with processes of blind variation, blind selection, and blind retention, up and down the line. Indeed, previous preselective experiments themselves are a source of *variation* for future selection. And the process of *retention* has both its rational side, previously mentioned, and a blind side as well, which will be discussed here.

In its blind aspects, retention at the cultural level is composed of a number of different mechanisms. For example, human beings appear to imitate unconsciously the behavior of others "simply because it is there," as it were. But also in many contexts they conform because they feel they are *supposed* to do so. When imitation contains this coercive element, it may be said to be moral. A much broader way of viewing morality is as a system of conditioning. The moral system has two basic functions. It militates first for internal social system equilibrium and second for the retention of cultural tradition (Boehm 1977). These functions are partly blind, but to the considerable extent that conscious social engineering takes place, they may be preselective as well. Whenever preselection does not interfere, this blind moral valuing of cultural precedent is a potentially powerful mechanism of retention at the cultural level. Its strength may well

vary from one culture to another, but I believe that a substantial amount of blindly "traditionalist" sentiment is present in every human culture.

For cultural evolutionary process, it is important, when morality and cultural tradition function together as the extrasomatic retentive system, that this device not work *too* efficiently in its blind aspects. In fact, there are a number of mechanical factors that help to prevent maladaptively rigid retentiveness. One such source of variation is the imperfections that exist in the transmission of information through oral tradition. Lord's (1960) study of South Slavic oral epic demonstrates well the fact that even the same individual cannot reproduce exactly the same corpus of information on successive tries. Another built-in source of variation is the differences among individuals who carry cultural information. In addition, there are other mechanisms that are less "mechanical," in that rational choice is involved. The tension between real and ideal values, which is empirically present in every culture, is a source of potential flexibility, one that allows the natives to choose consciously between alternatives within their tradition. Finally, human political process, and the ability of humans to manipulate the moral system in order to achieve new goals of policy or power, provide a means for the natives to restructure their own tradition actively, preselectively, and quite rapidly.

In terms of the mechanisms described above, the importance of preselection must be strongly emphasized. First, it is possible for preselective process to abrogate the retention of cultural tradition, when certain aspects of it become dysfunctional in a way that is perceptually obvious and deliberate changes are instituted. But in other cases, preselection *contributes* directly to retention, in that blind tendencies to value precedent for its own sake are blended with recognition of the functional value of various elements of tradition, where such utility is perceptually obvious as measured by native values. Thus, selective retention in cultural systems contains a powerful rational element that sometimes reinforces and sometimes interferes with the effects of blind retentive mechanisms.

Intensity and Type of Rational Selection

The definition of preselection requires (a) that the adaptive response is *intended* to be adaptive, (b) that it involves substantial predictive penetration into the future, and (c) that the adaptive problem and its solution are relatively complex. In order to develop the concept unambiguously, I have dwelt upon the more dramatic and rapid kinds of preselective decision making where novel problems are encountered, and to utilize existing descriptions I have concentrated upon preselection at the group level, where the presence of both variation and rational selection is most easily seen. However, there is no necessity that preselection be rapid, highly dramatic, or at the group level, nor need it involve problems that are highly novel.

The most dramatic preselective episodes surely are those in which an adaptive problem is critical for survival and highly novel as well, and the human response is rapid, decisive, and at the large group level. But I would assume that the bulk of preselective activity involves more of an ongoing process of humans helping to steer their adaptations in their larger aspects, through relatively modest and familiar adjustments. An example would be pastoralists' manipulations of herd composition, or decisions of agriculturalists as to strategies for exploiting different kinds of arable land (see Rutz 1977). These processes would come under Merrill's (1959) definition of routine innovation, but they fulfill the three criteria for preselection as well.

When problem solutions fall *below* the threshold I have defined for preselection, they may be referred to in terms of "rational micro-decision-making," to contrast with "rational preselection." Rational micro-decision-making, like preselection, may be either routine or novel in the degree of innovation involved. The control of cracking during

pottery drying processes analyzed by Merrill (1959) is an example of rational micro-decision-making at the routine level. Because I am attempting to make the preliminary case chiefly for preselection in its more extreme forms in this paper, no further space will be devoted to discussion of fixing boundaries on this continuum.

METHODOLOGICAL STRATEGIES FOR THE DIRECT STUDY OF NATIVE DECISIONS

In developing a more powerful explanatory context for the study of adaptive decision making, it will be necessary to analyze the ways that *purposive* kinds of variation, selection, and retention involved in preselection interact with *blind* sources of variation, selection, and retention. Such investigation must begin by focusing on processes through which knowledge concerning the natural and sociopolitical environments is acquired, organized, stored, shared, utilized, and resynthesized in terms of individual and group self-interest, over relatively long periods of time.

To do this, serious attention must be paid to human cognitive capacities, as these operate purposively over time at the feedback level to process perceived information concerning the environment. Rappaport (1968:152, 240-241) has suggested, writing of the Maring, that the ways they cognize their natural environment may be important for adaptation, but processually oriented investigatory strategies have been little explored by cultural ecologists or by cognitive anthropologists, aside from a few studies like that of Johnson (1974). It is suggested that detailed study of the *processes*[7] through which information is *used* could lead to a significant further increase in our respect for non-literates as applied protoscientists.

A systematic approach for studying decision making is needed, to fit with the theory proposed in this paper. In thinking of methods, the first problem comes with selecting the level of decisions to be studied. Individual decisions in routine innovation are always accessible to direct study, and Ortiz (1967) has described quite thoroughly the individual managerial decision process of Colombian agriculturalists, focusing specifically on decisions of individual actors. Howard and Ortiz (1971) have discussed extensively the problems inherent in isolating, describing, and interpreting individual decisions as an important empirical focus for the study of social process. They make the important point that the natives frequently may not be conscious of the basis for their own decisions, and emphasize the need to shed the economist's idea of an omniscient actor. They also define quite carefully the conditions under which native rational decision making may come into play, and suggest that decisions are best viewed as a continuing process of similar types of decision, rather than as isolated events.

Howard and Ortiz follow Firth's (1956) view of individual choices as the determinants of social organization and emphasize several advantages such a focus brings. One necessarily comes to understand the indigenous perspective in studying decisions, but, in studying a native's decisions closely, one also gains a great deal of insight into the "ecological determinants of his behavior" (Howard and Ortiz 1971:215). The authors view their discussion not as a theory but as "a conceptual frame of reference with specific methodological implications" (1971:213). With respect to the preselective theoretical concepts under development here, their provisions for the study of natural decisions at the individual level fit in very well.

In this paper, the *group* level of decision making and action has been emphasized in developing a theoretical framework for preselection, partly because cultural evolutionary process is most clearly discerned when a consensual decision process enables an entire corporate group to take a common course on the basis of a decision that is made very rapidly. Emphasis upon group decision process goes far beyond exemplification, how-

ever; I have also maintained that group decision making leads to natural selection at the group level. An important clarification must be made here. Natural selection at the group level theoretically can take place in humans even in the absence of the corporate group decision-making process; the traditional pattern of individual decisions alone provides a rational input that easily could affect the relative adaptiveness of different groups. Japanese studies of macaques (Itani 1958, Kawamura 1954) are suggestive in this respect for nonhuman primates, and similar processes are significant for humans. While I shall emphasize the need to study group decisions as well as individual decisions, these two types of decision process may be separable only for analytic purposes, when one investigates directly a case of rational adaptive behavior.

It might be expected that the less conscious motives of individual natives would become more readily apparent to the ethnographer where *group* decision process operates. But Barth's (1961) fine description indicates that "debate" may in fact be highly euphemized. A very good facility in the native language would be necessary to understand such subtle negotiations. Barth's description also makes it clear that decision dilemmas may be posed in terms of goals in quite different domains; in this case, social values competed with values connected with maximization of herd health and size. Since the various goals that compete potentially may be in any cultural domain viewed to be important by the natives, it is necessary that the investigator be a good all-around ethnographer. In particular it will be useful to understand the more general cultural values that help to determine specific goals. The study of values by anthropologists for long has been unduly "descriptive" and static. But the study of values should articulate very well with the study of decisions in a dynamic theoretical context.

Barth (1961), Meggitt (1977), and surely many others have demonstrated that it is possible to describe specific decision processes at the group level, using standard ethnographic techniques. But much of the discussion of special methodology of Howard and Ortiz (1971) could be applied to group decision processes as well as individual ones. In particular, their emphasis on viewing a decision under study in the light of previous decisions is equally applicable to groups. In fact, I believe it will be in group decisions of a dramatic nature that *discontinuities* with past patterns may be discerned best.

There is the methodological problem that the more dramatic kinds of group responses that put preselective capacities to more ultimate adaptive tests occur very infrequently under normal circumstances. But it is possible to follow on the heels of ecological stress, as it were, to study groups faced with special problems such as extreme drought conditions. Such studies, if used properly, may have practical value for the natives as well as for anthropologists.

In studying group and individual decisions, we should view the natives as applied scientists. Native science, like so much of our own (see D. T. Campbell 1978), is highly qualitative but nevertheless predictive. But nonliterates are under no pressure to make their assumptions public; the practical result is usually adequate to test their theory, and both prediction and evaluation may be wholly or largely "intuitive." This notion of the native as un-self-conscious applied scientist is derived from Malinowski (1948) and is directly applicable to the notion of preselection. With respect to methodology, many ethnographers have discovered to their pain that it is often very difficult or impossible for an intelligent native to articulate something that is both intuitive and too obvious to require discussion in everyday circumstances. Some methodological innovation will be required in this area.

In this connection, it is also important to heed the cautionary note issued by Radin (1927:22-24). This concerns the difference between what people say and what they really are thinking, when decisions are given supernatural rationalizations in order to gain social acceptance for them. Radin's point is that it is natural for ethnographers to take

such rationalizations far too literally, and to forget that a native who has the responsibility for leadership privately must be quite "practical" in his decisions if he is to hold the respect of the group. I believe that Buckley, as cited previously, has made this error. I would follow Malinowski, however, in making the assumption that problems involving the greatest unpredictability are most likely to force even the most astute natives to forego "practical" modes of making predictions and decisions for those that are supernatural. Thus, the greater the perceived uncertainty, the higher the probability that the most astute native leaders privately believe their own supernatural rationalizations.

With respect to group decisions in particular, the best method will be through direct observation combined with interviewing of individual informants. Past decisions may be studied through the recollections of informants, but careful attention must be given to the ways in which the past is rearranged interpretively in the culture. Impending decisions will be a fertile ground for ethnographic investigation as well, while hypothetical situation elicitation techniques may be useful as long as the situational context is full and uncontrived and the native response appears to be "natural."

These recommendations turn the study of decision making from a formal analysis that is primarily based upon knowledge about outcomes, toward a fuller understanding of indigenous perceptions in a processual context. Such an approach will greatly enhance the findings of economic anthropologists and cultural ecologists, as well as those who study the internal and external sociopolitical adaptations of nonliterate groups. With respect to the currently necessary shift in anthropological attention from nonliterate natives to "modern" natives and their practical problems, developing a more adequate framework for the study of decisions is equally important; these methods should be equally valid there.[8] However, educated natives may be able to help us more in the interviewing process, because they will be better versed in the art of public scientific exposition.

In concluding this discussion of methods, I should emphasize that conventional "static" approaches to ethnographic description and explanation will be adequate for studying the background of decision behavior. However, even to describe a single decision, a snapshot frozen at one point in time is not enough. Minimally, it must be approached as a case history, beginning with an objective account of the problem's coming into being, followed by descriptions of the process through which the problem is recognized and diagnosed by the natives, of the experiments, if any, that accompany the decision process, with any revisions these may engender, and then the enactment of the decision and the evaluation of the natives as to the adequacy of the outcome. The previous pattern of decision making must also be considered. Finally, to assess objectively the adaptive effectiveness of a preselective effort, the ethnographer must make an outside evaluation of the practical effects of the decision and of any new insight gained by the natives from the decision process, in terms of future ability to cope with problems.

FALSIFIABILITY OF THE PRESELECTIVE HYPOTHESIS

If one looks at preselective living systems in comparison with those in which preselection is absent, it is easy to hypothesize that their flexibility for adaptive modification confers a special adaptive advantage upon species that preselect. When this kind of flexibility results in the creation of instruments of instant destruction for the entire species, then an assessment of superior adaptive effectiveness becomes somewhat problematical. But humans have in fact learned to use fire to their own advantage; the same may well be true of nuclear energy.

Some preliminary validation of the preselective hypothesis may be found in existing studies. In the case of conflict management, preselective intentions are apparent and

effects are obvious. There, the results are generally treated as being adaptively efficacious by the legal and political anthropologists who make such studies of internal social adaptations. In my own study (Boehm 1978) of the Montenegrins' adaptation to their external political environment, the intentions and effects were easily documented, but it was difficult to evaluate the adaptive results of preselection in any precise, definitive manner. Linton (1943) has characterized nativistic movements as *deliberate* attempts made by large groups to implement major changes in their own external political adaptations. Thus, preselective intentions are quite apparent. The immediate behavioral effects are well described (see DuBois 1939). But because such movements are last minute and desperate actions, the adaptive results again are difficult to evaluate.

We are left with the problem of fixing a standard against which the results of native preselective experiments may be measured. To evaluate these objectively and precisely presents serious theoretical and methodological difficulties. It would be necessary to compare an adaptation made with the help of preselection with a real or putative adaptation taking place in the same circumstances solely through a combination of teleonomic and microdecision processes, *without* preselection. There are two problems. One is that these other two processes do not merely coexist with preselection, but rather the three kinds of process functionally interpenetrate with one another. The other is that a human group devoid of preselection may be impossible to find and perhaps inconceivable.

Eggan's (1954) method of controlled comparison might be employed here. For example, in Onoge's remarkable study (1970), certain Nigerian tribesmen migrated to a novel environment to form a communal organization that promoted highly rational economic policies through a radical utopian experiment accompanied by charismatic leadership. The Ayetoro experiment prospered quickly and is one of the most highly *successful* cases of dramatic preselection in the ethnographic record. It should be possible to evaluate the adaptive effectiveness of this experiment and to compare it with that of other tribesmen who stayed with traditional adaptations. But because the decision to remain behind presumably was preselective as well, this really would be a comparison of different degrees of preselection, not of preselection vs. its total absence. For this reason, it would be better to view such a comparison as a useful first step, using it to falsify the more limited null hypothesis that the *degree* of preselection makes no difference in adaptive effectiveness.

Therefore, with respect to the basic hypothesis that preselection significantly increases adaptive potential by supplementing and sometimes circumventing teleonomic processes, one must return to the typical evolutionist's argument: that because there is so much preselection going on, and because it appears to do little damage to adaptation, it may be assumed to have been selected for directly on the basis of adaptive value, if (and only if) a logical case may be made for its having adaptive functions. This kind of argument is made to explain the existence of teleonomic mechanisms by all good Darwinians. I have developed a similar logical case for the efficaciousness of preselection as strongly as possible, given limitations of both data and space.

Just as biological evolutionists must rely upon the convergence of various unfalsifiable hypotheses into a central theoretical framework that has explanatory power, I believe this may be done also for preselection at the cultural level. It is for this reason that I have ranged so broadly in trying to build a convincing preliminary case for the existence and adaptive importance of this evolutionary mechanism.

CONCLUSIONS

The idea of preselection entertained in this paper is by no means novel. In a modern context, D. T. Campbell (1965) has defined quite precisely the place of preselection in

evolutionary process, while Goldschmidt (1959, 1971, 1976) has consistently emphasized the potential importance of conscious decision making among nonliterate natives. Bennett (1976) has discussed very programmatically the notion of "anticipation" as it relates to problems of policy in modern society, and Reynolds (1973) has argued eloquently that members of formative states may have been able to conceive of idealized models and to pursue their fulfillment. Merrill (1959) has suggested that routine innovation, which is rational, may operate at a level that I would call preselective. And, finally, a significant appreciation of native rationality is explicit in the work of all economic and ecologically oriented anthropologists who seriously undertake to study decisions or their effects at any level.

However, the *direct* study of native decisions has been neglected up to the present. Furthermore, the overall place of rational decision making in the conceptualization of culture and in theories of cultural ecology or evolution has been denied or left in a state of extreme vagueness. In diagnosing these problems, I have suggested that cultural theories of society, adaptation, and evolution have remained unhealthily static. This is because the study and explanation of specific processes in a way that is scientific have been highly problematical for anthropologists, as for everyone else. I believe that a strong theoretical and methodological focus on decisions would provide two advantages presently lacking in approaches that aim at being processual.

First, with respect to *variation and selective retention*, many of these processes take place at a predominantly rational level, in the form of preselective decision behavior by individuals and groups. This behavior is much more amenable to direct study than are the often very complex teleonomic processes and rational microdecision processes, which also contribute to adaptive outcomes in ways that may be indirect or very subtle. This is because the actual mechanisms, particularly for teleonomic adaptive process, are difficult to isolate except in rare instances where environmental change is rapid and radical and an ethnographer happens to be present to record the entire process. By contrast, preselective mechanisms, in the form of decision behavior, should provide a more accessible domain in which to isolate and study the process of cultural variation and selective retention.

Secondly, the investigation of preselective decision behavior as an adaptive mechanism of living systems should make it possible to describe directly some of the critical *feedback processes* through which humans and certain other animals respond to environmental problems, when these responses are heavily conscious and purposive.

Thus, decisions provide a potential research focus that will enable us to describe and explain the adaptive behavior of individuals and groups more effectively, with the help of two powerful theoretical models that are quite well developed already, coming out of biology and general systems theory. In moving from biological to cultural adaptation and evolution, and from purely teleonomic to significantly preselective systems, it is important that the models not be applied too literally. The mechanical nature of variation and selective retention is changed both qualitatively and quantitatively by the addition of rational inputs. This is true for the adaptive behavior of individuals, but in cultural processes, selection at the *group* level also becomes much more important than in biological processes, especially when political capacity to make and implement preselective adaptive decisions above the individual level becomes prominent, as in segmentary societies and centralized states.

In making the preliminary case for preselection, several lines of reasoning have been developed simultaneously, in the expectation that their point of convergence might be accepted as an important potential point of departure for needed development in an-

thropological theory and method. In particular, I have stressed the need to take native rationality more fully into account, as well as the advantages of developing an approach to studying process through *specific mechanisms.* In emphasizing the importance of preselective decisions, I have not sought to exclude teleonomic or microdecision processes from the arena of study. But I have made the assumption that often preselective mechanisms will be far easier to isolate for study, because they sometimes take place as discrete events, particularly when a group decision process is involved. They also will be easier to document, because there the processing of information in the environment is direct, through cognition, rather than metaphorical, as is the case with teleonomic mechanisms. With preselection, there is another marked advantage for the analyst, in that the agency for processing this information is a native who sometimes can speak to us about what he or she perceives to be taking place.

Cultural ecologists and cultural evolutionists have succeeded rather well in identifying and studying external environmental variables related to cultural adaptations. But it is a major contention of this paper that approaches to human adaptation or evolution that are dogmatically or totally "materialistic" will miss out on accounting for a most significant and interesting aspect of cultural adaptations. Purely on a qualitative level, understanding the active side of native rationality is important because it helps to define fully the nature of the creature involved. But as an addition to teleonomic process, preselection also transforms adaptive processes both qualitatively and *quantitatively*, in terms of the potential rapidity and novelty of adaptive "experiments." Therefore, wherever the natural environment does not restrict the possible adaptations of a human group to a single narrow course, the action of preselection must be taken into account as a causal factor that is by no means entirely predictable in terms of external environmental exigencies.

To set up a framework in which preselection may be studied, some suggestions have been made for the redefinition of the culture concept, in connection with the processual approach to open adaptive systems developed here. It is believed that the kind of framework proposed in this paper will make possible a more thorough exploitation of useful models available from the theory of biological evolution and from systems theory, without losing sight of the distinctively purposive features of human (and certain other) cultural adaptive systems.

Although this paper mainly focuses on the action of native rationality in more complex aspects of adaptation, there is implicit in it a further argument that is also important. *Process* is something that behavioral scientists talk about a great deal, but often shy away from because processual studies of living people are necessarily so qualitative. It is to be hoped that the preselective concept, along with the more general theoretical framework outlined here, may prove useful in helping to identify much more precisely the *mechanisms* of adaptation that operate at the cultural level. This may be viewed as a preliminary step in the direction of bringing anthropology closer to the scientific approach to *process* that Darwin brought to biology.

This preselective hypothesis stands ready to be exploited and tested in the arenas of natural subsistence strategy, native economic behavior, nativistic and other utopian movements, charismatic leadership episodes, state formation, warfare and territorial conflict, management of conflict, cases of internal reform in sociocultural systems, studies of public policy and evaluation, and anywhere else that crucial problems in adaptation become perceptually obvious to the natives, whether they are "prescientific" or "modern." This pertains to all humans and to any other beings who are capable of thinking through adaptive "experiments" that are relatively complex and choose to take an active part in determining their own evolutionary destinies.

NOTES

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[1]The use of the term "rational" is commonplace; Webster's (1959) definition conveys the meaning intended here. For the sake of style, "rational preselection" will be abbreviated frequently to "preselection," with no change in meaning intended.

[2]I use the term "native" here and elsewhere in the paper to designate *any* category of people studied by anthropologists. Although the ways in which I employ this potentially controversial term in this article should make my semantic intentions clear, clarification is appropriate, given the colonial implications of "native." Natives, thus conceived, may be nonliterate or literate, non-Western or Western, technologically pristine or modern, rich or poor. The less controversial term "nonliterate" is abandoned in part due to its inelegance. But also it is felt that in this era of increasing research in our own culture, anthropologists require a far more inclusive term for the people they study. "Native," in its already well known unbiased sense of "indigenous person," offers anthropologists a technical term for the people they study on a par with "subjects" studied by psychologists. My use of "native" here should be construed in this sense.

[3]Because "teleology" has so many different semantic senses I think this term should be avoided in the discussion of purposiveness in evolutionary process, to avoid even the flavor of final cause reasoning.

[4]See Hall (1959) for a liberal (and correct) view of the communicative power of nonverbal behavior.

[5]The entire problem of the relation between genotypic, especially cortical change, and the tendency of human culture to become more complex has been discussed by Wallace (1970), who believes that in the short run the growth of culture is more closely tied to external environmental exigencies than to genotypical evolution, except where brain size is a limiting factor (1970: 57-58; 71-72).

[6]In this discussion, I have deliberately side-stepped the task of trying to determine the role of genetics in cultural saltations. It is likely that such speculation will be inconclusive as long as we continue to know so much more about the evolution of the size of the brain than about the evolution of its structure and related functions. However, I would agree basically with Geertz's (1973: 68-69) view that the very close interdependency of somatic and extrasomatic evolution dates back to the beginning of the hominid line. Thus, any rapid "advances" inferred from manifestations at the cultural level would have been selected for, either at both the biological and sociocultural levels simultaneously, or at the sociocultural level alone, unless there were some kind of independent genotypic preadaptation that made possible a saltation at the cultural level.

[7]See Miller, Galanter, and Pribram (1960) for a discussion of the relation of knowledge and values to intention and action.

[8]Britan's (1977) pioneering study of a U.S. Government experimental agency applies qualitative and processual approaches to evaluating a formal institution designed to interfere productively with normal governmental bureaucratic processes.

ADDENDUM

Several authors or works must be added to the bibliography for this paper. First, the book cited by Rappaport (1967) represents a mere take-off point for his thinking about cognized models, which

are extremely relevant for the line of thinking developed here. He has discussed extensively the idea of the sacred as a means of "certification" for practical policies (Rappaport 1973), and also has elaborated on the "cognized model" as an information-synthesizing process which serves as the basis for making adaptive policy decisions. (Rappaport 1971).

With respect to Kummer's (1971) data on higher primate decision making, the experimental work of Menzel (1973) with young male non-free-ranging chimpanzees substantiates a strong hypothesis that such animals can communicate (and exert leadership) on a nonverbal basis with respect to adaptive resources. Kummer himself has informed me that one of his students is also pursuing this line of research.

With respect to the emerging focus on decisions in anthropological research, I must mention additionally the work of Barth (e.g., 1973, 1974), the Gladwins (1971), C. Gladwin (1976), Lingenfelter (1977), Prattis (1973), and Quinn (1975, 1976).

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